

Stability of self-gravitating accretion disks in galactic centers

Lumpy gravity

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How to fix lumpy gravy

No matter how many times you make pan gravy, lumps have a way of appearing—usually when you least want them.

http://www.ehow.com/how_114366_fix-lumpy-gravy.html



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Goodman (2003)



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Don't throw the gravy out. [...] You can still put Thanksgiving dinner on the table in time.

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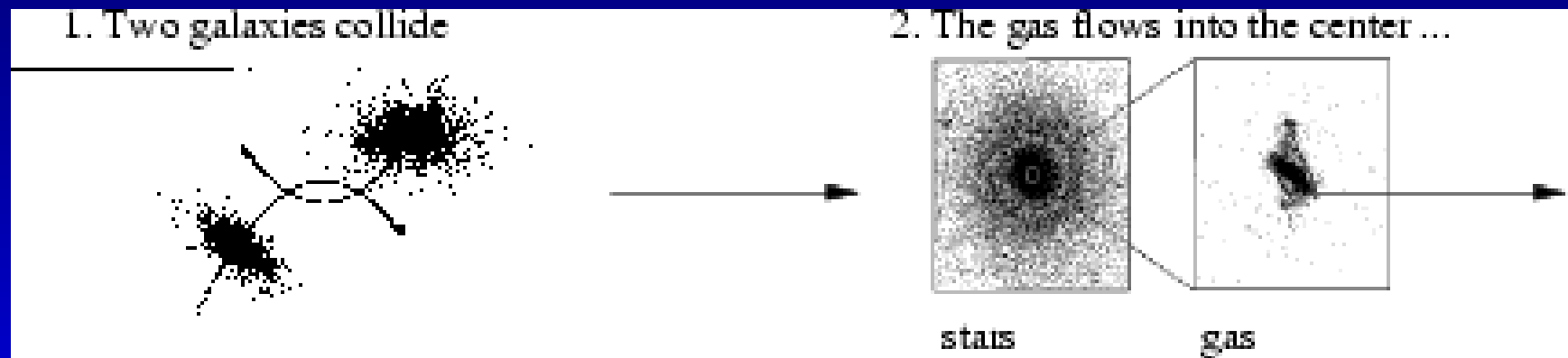
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A SMBH formation model

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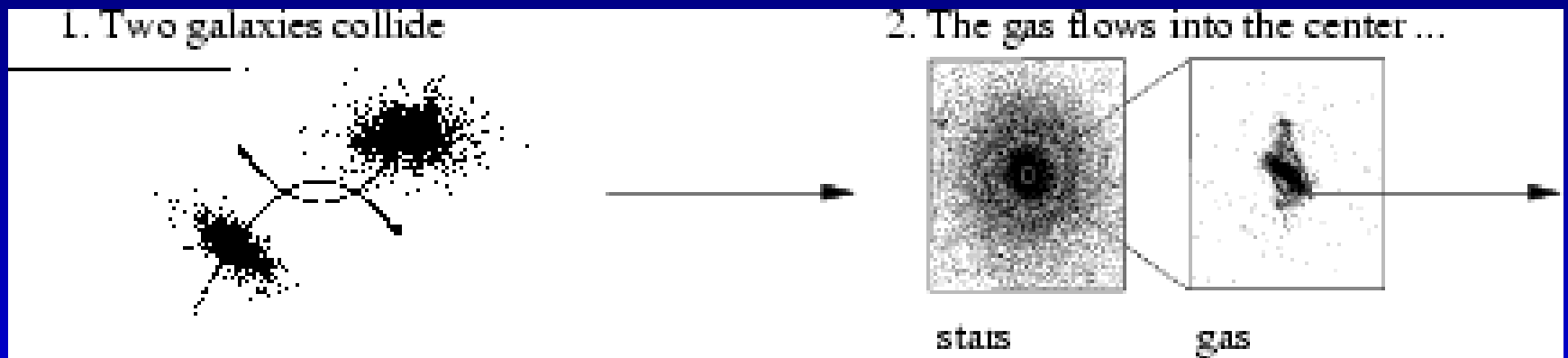


(Barnes, Hernquist, 1996)



A SMBH formation model

- merger of two galaxies \rightarrow gas flows into the center
- it forms an accretion disk that feeds the forming black hole



(Barnes, Hernquist, 1996)



Hydrodyn. simulations

- such a disk is gravitational unstable if it is not hot

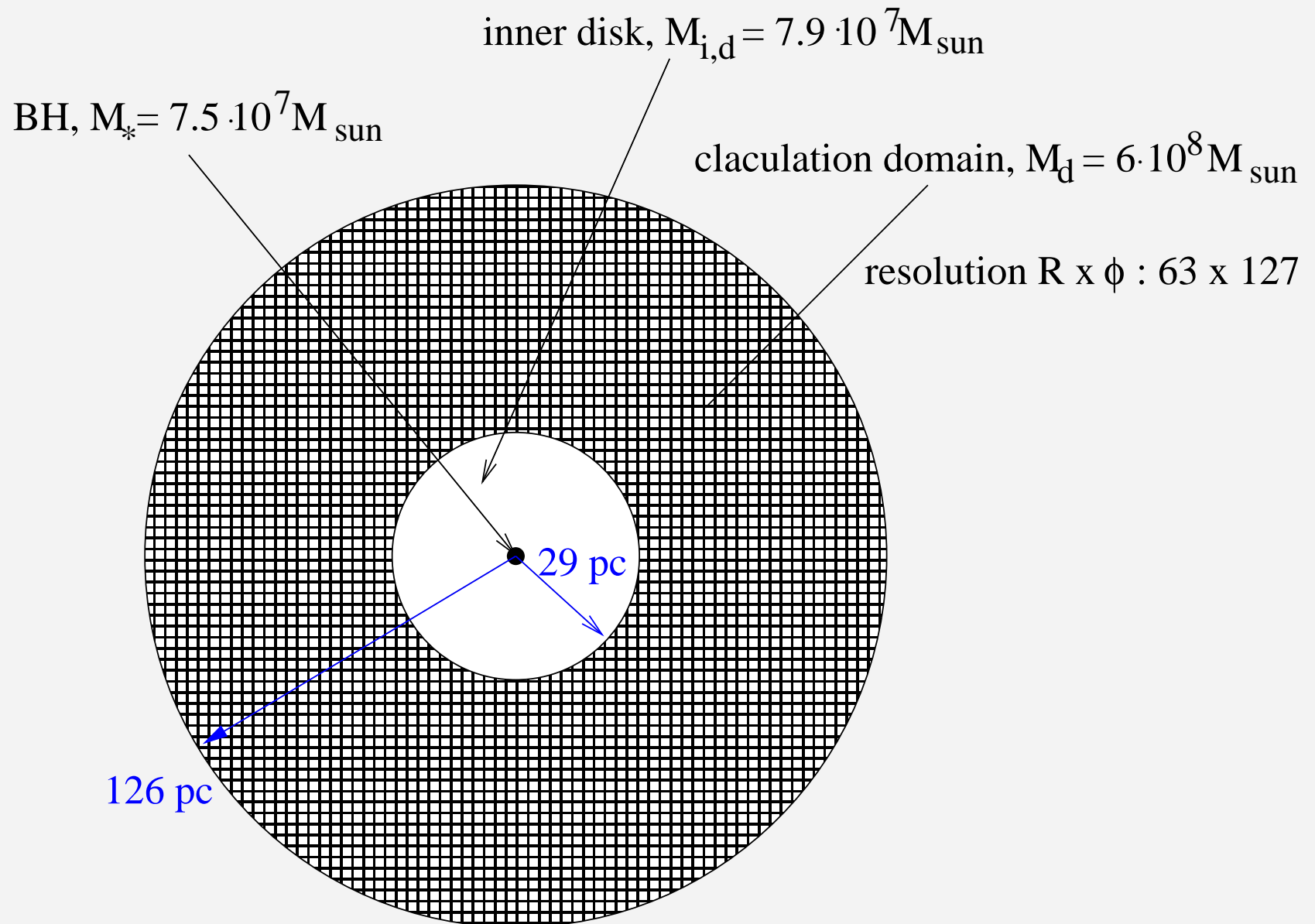


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- $R_i = 29\text{pc}$, $R_a = 126\text{pc}$,
 $M_d = 6 \cdot 10^8 M_\odot \gg M_* = 7.5 \cdot 10^7 M_\odot$
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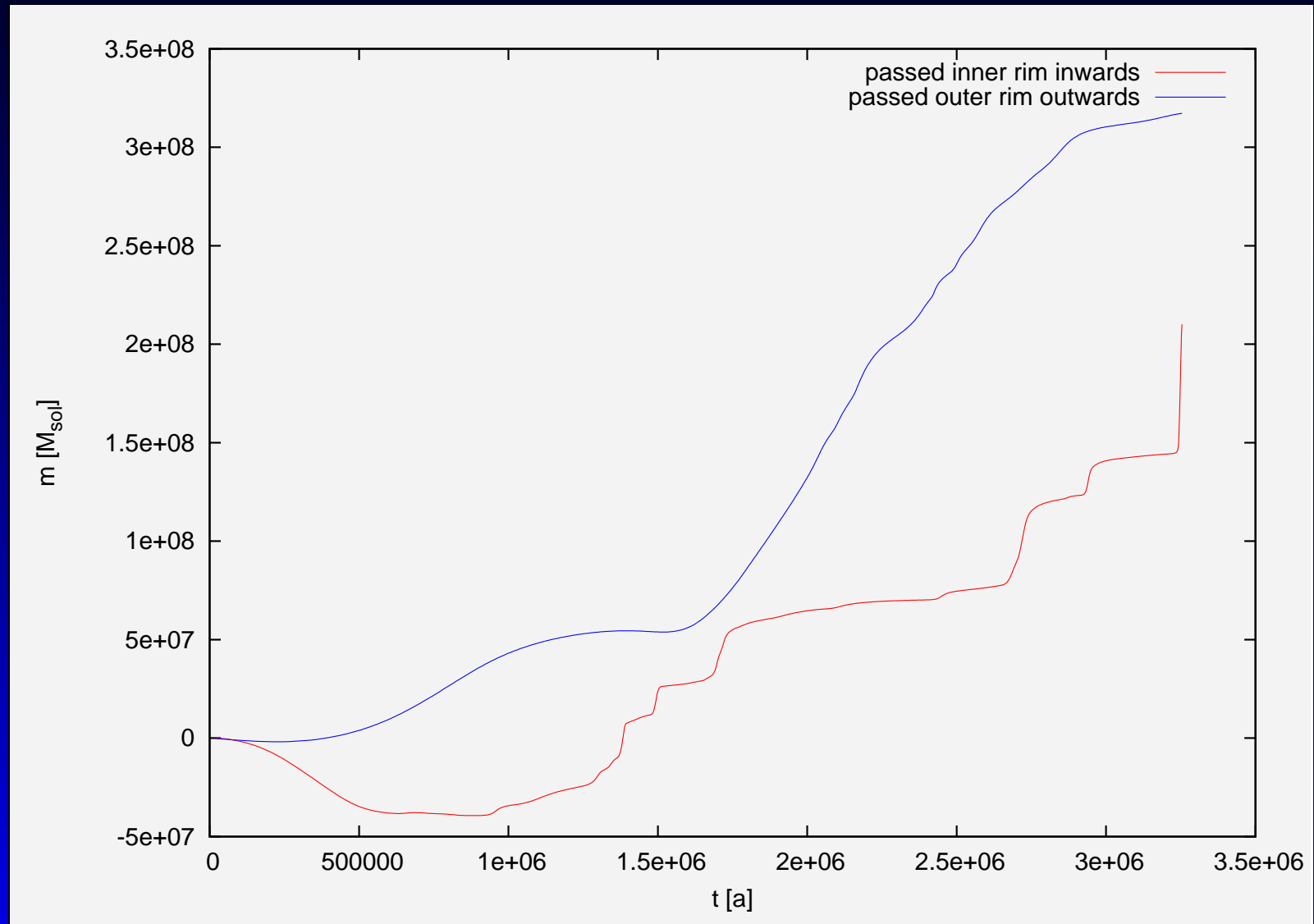


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Accreted mass



Interpretation

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- turbulent velocities and length-scales also match the β -viscosity
- $t_{\text{acc}} \propto \frac{1}{\Omega}$ also predicted by a clumpy disk model by Kumar (1999)



Summary

- formation model of SMBHs including large thin self-gravitating disks
- interacting clumps give very high accretion rate
- can be interpreted as a β -viscosity
- exciting accretion process
- supports this SMBH formation model
- but there's still a lot to do ...



References

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